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# The Economic Significance of Agriculture for Sustainable Development in Nigeria

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## Abstract

This study empirically investigates the agriculture-economic growth nexus in Nigeria. An economic growth model for Nigeria is specified and estimated through the use of Ordinary Least Squares as well as Johansen Cointegration and Vector Error Correction Model on annual data spanning from 1980 to 2012. The empirical result suggests that Agriculture is positively associated with economic growth in Nigeria. Results from this study also indicates that increasing the population of agriculture labour force will impact positively on economic growth. However, Infrastructure and human capital are found to be the key determinants of Nigeria's economic growth in the period under review. This study suggests that Nigeria policymakers should develop strategies that are geared towards infrastructure and human capital development in order to maximize the potential of the agricultural sector.

**Keywords:** Agriculture; Infrastructure; Human Capital; Economic Growth; Nigeria.

## Introduction

The concept of economic growth has incessantly kindled the interest of economists and policy makers around the world. From time immemorial, countries have unremittingly strived to achieve a certain level of economic growth in order to reduce poverty, unemployment, as well as to provide economic stability and increase the living standard of its citizens. This provides a cogent justification to why the concepts and

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theories of economic growth are extensively deliberated in mainstream economics. Given this background, there are several economic sectors that are often used by various growth. The Agricultural sector is one of such, particularly in the developing continent of Africa. Agriculture which includes but not limited to livestock production and crop production form the primary occupation of a large number of people living in this region, thus making it an indispensable sector to Africa's economy.

According to Johnston and Mellor (1961) as cited in (), agriculture provides manpower to the various firms in the industrial sector, provides foreign exchange through export of agricultural produce, ensures food availability to meet domestic needs, contributes to the proliferation of domestic savings and investment and creates a market for industrial output. Likewise, Agriculture has been perceived as a potent tool for providing better nutrition to the poor at an affordable price, thus serving as a poverty reduction approach especially in the continent of Africa that is characterized by high poverty prevalence. Additionally, agriculture ensures price stability as well as provides an attractive niche for Foreign Direct Investment (FDI), which is an essential macroeconomic variable necessary for stimulating economic growth. These aforementioned reasons justify the pronouncement of Rostow (1960) that agriculture is the requisite take-off stage necessary for the accomplishment of economic growth and development.

Statistical evidence indicates that the agricultural sector in Sub-Saharan Africa (SSA) employs approximately 65% of the region's labour force (AGRA, 2013). This presents an indication that this sector has high labour force absorption capability. However, despite the enormous contribution of agriculture to Africa, the region still experiences high unemployment rates and poverty. Furthermore, the agricultural sector contributes a meagre 32% towards the region's Gross Domestic Product (GDP). This statistic indicates a low productivity in the region's agricultural sector.

In Nigeria, the agricultural sector is a major contributor to the economy. Over 60% of the working population is employed by this sector, it also contributes over 40 percent of the Gross Domestic Product (Nwafor, Ehor, Chukwu and Amuka, 2011). However, despite the contributions that agriculture has on Nigeria's economy, there is still a high rate of poverty and unemployment particularly in the rural regions where agriculture is the primary occupation. Researchers have attributed the poor performance of this sector to the discovery of oil which resulted in the relegation of the agricultural sector to the background (Ekpo and Umoh (2012) Ukeji (2003). This ensued to the substantial decline in the share of agriculture from 60% during the 1960s to 48.8% in the 1970s and 22.2% in the 1980s, and contributed approximately 41% towards Nigeria's GDP between 2001 and 2009 (Ogen 2007, Dim & Ezenekwe, 2013; Ogbalubi, & Wokocha, 2013). Although the 2001-2009 statistics shows an improvement from that of the 1980s, it is still much less than that of the pre-oil era of the 1960s. In addition to this, poor infrastructure such as transport and storage facilities, lack of mechanized tools and implements, poor research and development with regards to development of new animal breeds and genetically enhanced crop seeds, coupled with corruption, embezzlement and misappropriation of government funds directed towards the improvement and development of agricultural practices are some other factors that can be linked to the debilitated growth and productivity in this sector.

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*Research problem*

In the early 1960s, agriculture was Nigeria's economic fortress. However, after the discovery of oil hitherto, the economic pendulum swung towards the oil sector leading to the neglect of agriculture. The oil sector in the last couple of years has been dismal due to the recent a significant decline of oil prices in the world market. According to the data obtained from the Organization of Petroleum Exporting Countries (OPEC, 2015), the weighted average prices of oil fell to its lowest price since 2006 (see Figure 1).
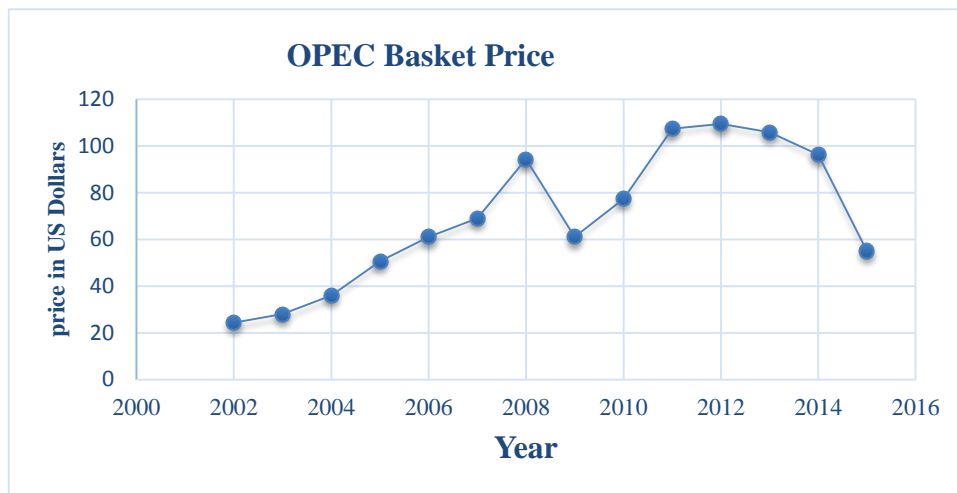


Figure 1: The Weighted Average Prices of Oil

Oil prices fell from $107.46 in 2010 to $96.29 in 2014 and further declined significantly to $55.12 in 2015. The implication of this oil price volatility is that, an oil producing country like Nigeria may possibly experience a substantial decrease in oil revenue which is anticipated to impact negatively on its economic growth. Indeed, these statistics stimulated the study to investigate whether it will be worthwhile if Nigeria Policymakers resuscitate the agricultural sector particularly during this period of oil price decline. By so doing, this study will provide a more recent narrative and quantitative approach to empirically investigate the agriculture and economic growth nexus with the aim of providing policymakers with a present-day knowledge on the impact that agriculture has on Nigeria's economic growth.

*Research questions*

- What relationship exists between Agriculture and economic growth in Nigeria?

- Is agriculture contributing to Economic Growth in Nigeria?

- Will increasing Nigeria's agriculture workforce be economically beneficial?

*Research objectives*

- To investigate the problems affecting the Agricultural sector and make suggestion on the possible solutions.

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- To determine the direction to which government expenditure should follow.

## Literature review

Over the years, the agriculture and economic growth nexus has been extensively debated in mainstream economics. Most of the profound arguments in this regard have opined that agriculture plays an important role in economic growth and development, particularly in developing countries such as Nigeria. Sanjuan-Lopez and Dawson (2010) investigates how agricultural exports contributes to the economic growth of 42 underdeveloped countries through the use of panel cointegration technique. The outcome of the study suggests the presence of a long run relationship between both variables.

Similarly, Iganiga and Unemhilin (2011) in a study conducted on the impact that government expenditure on agriculture has on Nigeria's agricultural output using the Vector Error Correlation Model on data spanning from 1970 to 2008. The findings suggests a positive relationship existing between the observed variables. However, the study also opines that the impact of the Nigeria government agriculture expenditure on economic growth is not immediate. Also, Yao (2000) investigated the importance of agriculture to China's economic growth through the use of cointegration analysis on data between 1952 and 1996. The results concludes that despite a decline in the contribution of agriculture to GDP, it still remains an essential sector necessary for achieving growth in other economic sectors.

Another study by Gardner (2003) which investigates the agriculture and economic growth nexus did not find sufficient indication that agriculture leads to economic growth. However, Awokuse (2009) in a study of 15 developing countries through the use of Autoregressive Distributed Lag Model indicated that agriculture is a vital component for achieving economic growth. Meanwhile, Tiffin and Irz (2006), in a study of 85 countries through the use of Granger-Causality and cointegration tests concludes that in developing countries agriculture is the causal variable, however, in the case of the developed countries, the direction of the causality is imprecise.

Umaru and Zubairu (2012) investigated the contributions of both the petroleum and agricultural sector in Nigeria using data between 1960 and finds statistical evidence that the agricultural sector is the more potent sector compared to petroleum sector. Suleiman and Aminu (2010) study also revealed that agriculture has the highest contribution to Nigeria's economy compared to the Petroleum and manufacturing sectors.

The findings of Katircioglu (2006) which explores the agricultural output and economic growth nexus in Cyprus with annual data spanning from 1975-2002 through the use of cointegration and granger causality finds the presence of a long-run relationship between both variables, furthermore, the study also provides statistical evidence of a bidirectional causality between agricultural output and economic growth.

Based on the aforementioned studies, it can be seen that despite the agricultural sector is vital to achieving economic growth. In the case of Nigeria, despite the neglect of the agricultural sector due to the growth of the secondary economic sectors specifically the oil sector; agriculture still remains a viable economic sector. This can be attributed to the

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various agricultural reform policies that were created overtime geared towards the revival of the sector such as: Impute Commodity and Supply Policy which was directed towards the ensuring effective and efficient supply of modern farm inputs, fertilizers and machinery,  the Presidential Initiative on Cassava (PIOC) which was directed towards increasing Nigeria's competitive competence in the production of a wide range of products from cassava such as cassava flour and starch and the Presidential initiative on Rice (PIOR)  which was aimed at increasing the country's rice production capacity.

In order to evaluate the Agriculture-economic growth nexus in Nigeria, this study will not only use Agriculture output as a proxy for agricultural growth, it will also through the use of the agriculture workforce variable estimate the effect that agricultural labour force has on Nigeria's economic growth. Finally, a positive relationship between agriculture and economic growth is hypothesized for Nigeria.

## An Endogenous Growth Model for Nigeria

The endogenous growth model or the new model of economic growth was instigated based on the criticism of the neoclassical growth model. The endogenous growth model connotes that endogenous factors such as government policies, human capital substantially affects economic growth. In simple terms, this model lends credence to human capital and new technologies in providing explanation to economic growth. Therefore it is based on this premise that an endogenous macroeconomic growth model for Nigeria is created as follows:

$$\ln GDP = \beta_0 + \beta_1 \ln AGVA + \beta_2 \ln GFCF + \beta_3 \ln EDU + \varepsilon_t \qquad \textbf{(1)}$$

The multiple linear regression depicted in equation (1) will be used to examine the relationship between agriculture and economic growth in Nigeria. From equation (1), lnGDP represents the Gross Domestic Product (GDP), a proxy that is used to depicts the rate of economic growth, lnAGVA refers to the Agriculture value added, a proxy for the agriculture performance in Nigeria, lnGFCF connote Gross Fixed Capital Formation which is used as a proxy to depict infrastructure development, the lnEDU variable represent the human capital term. $\beta_0$, $\beta_1$, $\beta_2$ and $\beta_3$ are the coefficient of the explanatory variables and $\varepsilon_t$ refers to the stochastic error term. The data for each variable in the model are annual secondary data spanning from 1980 to 2012 obtained from the World Bank's World Development indicators and Africa Development Indicators. All the variables used for this study are in the natural log form.

## Empirical methodology

The unit root test is used to investigate whether the stochastic properties of the data series used for this study are stationary or otherwise. According to Engle and Granger (1987), the reason for applying this test is to avoid the possible estimation of data which may present spurious results. The unit root test in this study is investigated through the use of the Augmented Dickey Fuller (ADF) test Dickey and Fuller (1979) and the Phillips– Perron (P–P) test Phillips and Perron (1988). If the data series are found to be nonstationary, then a test is carried out using the first difference of the variable. However, if the variables becomes stationary, then a conclusion can be made that the variable is

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integrated in the order of one I (1). The results of both tests procedures suggests the rejection of all variables at level I (0).

### Table 1: Results of Stationarity (ADF Unit Root) Test

| Variables | The Augmented Dickey Fuller (ADF) | | Phillips–Perron (P–P) test | | Order of Integration |
|---|---|---|---|---|---|
| | Constant | Constant and Trend | Constant | Constant and Trend | |
| lnGDP | -5.09(0.00)** | -6.93(0.00)** | -5.08(0.00)** | -15.1(0.00)** | 1(0) |
| lnAGVA | -4.90(0.00)** | -6.18(0.00)** | -4.91(0.00)** | -6.81(0.00)** | 1(0) |
| lnGFCF | -3.89(0.01)** | -5.34(0.00)** | -3.89(0.01)** | -7.45(0.00)** | 1(0) |
| lnEDU | -4.27(0.00)** | -3.86(0.04)** | -4.41(0.00)** | -7.21(0.00)** | I(0) |

**Note**: ** and *** signifies the rejection of the hypothesis at 5% and 1% levels respectively. Figures without parenthesis specify the t-statistics and in parenthesis represents the p-values.

### *Johansen Cointegration Test*

Since the result of the unit root test has indicted that the variables are stationary at level I (0), the next step is to examine the cointegrating relationships that exists between the variables in the endogenous growth model illustrated in equation (1). To achieve this, the Johansen cointegration test is used.

### Table 2. Cointegration test results of Nigeria's economic growth model

| No. of CE (s) | Trace statistic | 0.05 critical value | Prob. | Max-eigen statistic | 0.05 critical value | Prob. |
|---|---|---|---|---|---|---|
| None | 88.49** | 47.87 | 0.00 | 43.20** | 27.58 | 0.00 |
| At most 1 | 45.29** | 29.79 | 0.00 | 27.02** | 21.13 | 0.00 |
| At most 2 | 18.26** | 15.49 | 0.02 | 13.13 | 14.26 | 0.07 |
| At most 3 | 5.13** | 3.84 | 0.02 | 5.13** | 3.84 | 0.02 |

**Note**: **Denotes the rejection of the null hypothesis of cointegrated vectors at a 5% level of significance. Computations with Eviews 9.0

The result presented in Table 2 reports both the trace and maximal eigenvalue tests results for cointegration. The former indicates four cointegrated vectors while the latter indicates three cointegrated vectors all at a 5% level of significance. This means that the results of both test suggest that the null hypothesis of no cointegration can be rejected and hence conclude that there is the presence of a long-run cointegrated relationship between economic growth and the explanatory variables depicted by equation (1).

### *Vector Error Correction Model (VECM)*

Having found the existence of a long-run cointegrated relationship between economic growth and the explanatory variables it is necessary to examine the short-term dynamics of the variables through the use of Vector Error Correction Model (VECM). The system

VECM equation illustrated in equation (2) consists of both the long-run and short-run associations between economic growth (lnGDP) and the explanatory variables (lnAGVA, lnGFCF and lnEDU) as shown below:

D(lnGDP) = C(1)*( lnGDP(-1) - 0.694724268075*lnAGVA(-1) -

0.315922112777*lnGFCF(-1) + 0.0133037513948*lnEDU(-1) -

0.0250592655452 ) + C(2)*D(lnGDP(-1)) + C(3)*D(lnGDP(-2)) + C(4)

*D(lnAGVA(-1)) + C(5)*D(lnAGVA(-2)) + C(6)*D(lnGFCF(-1)) + C(7)

*D(lnGFCF(-2)) + C(8)*D(lnEDU(-1)) + C(9)*D(lnEDU(-2)) + C(10)          (2)

From equation (2), the term C (1) depicts long-run adjustment coefficient. The terms C (2) to C (9) refer to the short-run causality coefficients of each variables earlier highlighted in equation (1) while the term C (10) represents the constant. The results of the VECM is presented in table 3. The R-squared of 0.64 suggest that 64% of the systematic variations of Nigeria's economic growth (GDP) are due to the influence of the explanatory variables (lnAGVA, lnGFCF and lnEDU). The C (1) term coefficient is negative and significant at a 5% level of significance which indicates the presence of a long-run relationship between lnGDP and the explanatory variables lnAGVA, lnGFCF and lnEDU. However, the terms C (2) to C(9) did not meet the criteria of having both a negative coefficient and having a level of significance that is less than 5% hence, suggesting the absence of a short-run relationship.

Table 3: Results of Vector Error Correction Model (VECM)

| Independent Variables | Coefficient | Std. Error | T-Statistic | Prob. |
|---|---|---|---|---|
| C (1) ** | -2.61 | 1.19 | -2.18 | 0.04 |
| C (2) | 1.78 | 1.00 | 1.77 | 0.09 |
| C (3) | -0.35 | 0.73 | -0.47 | 0.63 |
| C (4) | -0.64 | 0.54 | -1.18 | 0.25 |
| C (5) | -0.37 | 0.48 | -0.76 | 0.45 |
| C (6) | -0.38 | 0.28 | -1.35 | 0.19 |
| C (7) | -0.38 | 0.25 | -1.54 | 0.14 |
| C (8) | -0.96 | 0.54 | -1.77 | 0.09 |
| C (9) | 0.90 | 0.55 | 1.61 | 0.12 |
| C (10) | -0.01 | 0.06 | -0.03 | 0.97 |

**Note**: R-Squared = 0.64, Adjusted R-Squared = 0.42, F-Statistic = 2.96, Prob (F- Statistic) = 0.03. ** signifies the rejection of the hypothesis at 5% levels;

### *Estimation of Nigeria's Endogenous Growth Model*

The OLS regression test conducted for model 1 is based on the endogenous growth model depicted in equation (1). The outcome of the results which is presented in table 1 is quite reveling. The adjusted $R^2$ of approximately 0.84 suggests that the goodness-of-fit measures is sufficient enough to explain the systematic variability in Nigeria's economic growth. In other words, the explanatory variables lnAGVA, lnGFCF and

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lnEDU adequately explains 84 percent of the variations of lnGDP for Nigeria. AGVA has a positive association with Nigeria's economic growth. This suggests that increasing in AGVA fuels economic income through the export and domestic production of agricultural products which consequently has a positive spillover effect on the overall economic growth. The contribution of agriculture is found to be statistically significant. This findings is similar to those of Iganiga and Unemhilin (2011), Awokuse (2009), and Katircioglu (2006), who opined that agriculture has a positive effect on economic growth.

However, the explanatory variable lnGFCF has a positive coefficient and is statistically significant which suggest that it is positively associated with lnGDP. This means that infrastructural investment such as roads, good transport networks, storage facilities increases agricultural productivity and consequently resulting to economic growth. This result is in concurrence with those of De Long and Summers (1991), and Dash and Sahoo (2010), that infrastructure development is an important stimulus to economic growth.

lnEDU is also found to be positively associated with lnGDP. This is because increasing human capital will enhance labour productivity because the farmers for instance will be equipped with the technical know-how of adopting and using new agricultural practices and technologies which in turn will increase agricultural productivity and consequently result to economic growth.

Table 4: OLS Regression Results

| Variables | Model 1 | Model 2 |
|---|---|---|
| lnAGVA | 0.26* (1.71) | 0.27 (1.72) |
| lnAGPOP | | 2.38 (0.34) |
| lnGFCF | 0.18** (2.29) | 0.18** (2.26) |
| lnEDU | 0.47*** (4.07) | 0.47*** (4.01) |
| R-squared adjusted | 0.84 | 0.83 |

Notes: *, **, and *** denotes 10%, 5% and 1% levels of significance respectively. The figures in parenthesis represent the t-statistics.

Model 2 is used to investigate the effect of the agriculture population (lnAGPOP) on Nigeria's economic growth. The multiple linear regression used in this regards is as follows:

$$\text{lnGDP} = \beta_0 + \beta_1\text{lnAGVA} + \beta_2\text{lnAGPOP} + \beta_3\text{lnGFCF} + \beta_4\text{lnEDU} + \varepsilon_t \qquad (3)$$

The result of Model 2 is similar to that of Model 1 in the sense that the estimates indicates that lnAGVA is positively associated with lnGDP. Again, both lnGFCF and lnEDU are the most significant variables associated with economic growth in Nigeria. This present a strong empirical evidence that reiterates the stance that infrastructure and human capital are paramount sources of economic growth in Nigeria. The estimate of lnAGPOP has a positive coefficient that connotes a positive association with economic

growth. This means that increasing the number of people participating in agricultural practice will be beneficial to Nigeria's economy. It should be noted that the agriculture population variable (lnAGPOP) is not statistically significant in the period under review.

## Conclusions and recommendation

Given the volatility experienced in the global economy, a thorough understanding of the determinant of economic growth is necessary if economic stability is to be achieved, particularly in a developing country such as Nigeria. This study was geared towards empirically investigating the relationship between agriculture and economic growth in Nigeria through the use of Johansen Cointegration, Vector Error Correction Model (VECM) and Ordinary Least Squares (OLS) tests on data from 1980 to 2012. The empirical results indicates the presence of a positive relationship between Agriculture and economic growth in the long-run. Agriculture is found to stimulate economic growth in Nigeria and with the impact further boosted by the combination of infrastructure and human capital development.

According to the results of this study, infrastructure and human capital are the most significant contributory variables to economic growth in Nigeria. This study suggests that policymakers in Nigeria should implement strategies directed towards enhancing human capital and infrastructure development. In other words, more of the Nigeria government expenditure should be directed towards infrastructure, education and healthcare. Furthermore, evidence from this study also indicates that directing more of the Nigeria's population towards engaging in agricultural practices will increase economic growth.

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